RESEARCH PROPOSAL

A Statistical Study Of Crude Oil Prices And It's Effects On Indian Economy

A synopsis submitted to

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED (M.S)

For the degree of

Doctor of Philosophy

In

Statistics

Under the Faculty of Science and Technology

By
Mrs. Shital Vijay Baisane
M.Sc. (Statistics)

Guided By,
Dr. Vinayakrao Apparao Jadhav
Principal
Shivaji Mahavidyalaya, Udgir, Dist: Latur-413517
(M.S) INDIA

March – 2022

Table of Contents

Sr. No	Contents	Page No.
1	Abstract	1
2	Introduction	1
3	Review of Literature and Development in the subject	4
4	Objectives of the research	6
5	Methodology	7
6	Importance of study	8
7	Proposed work plan	9
8	References	10

Title of the Research Topic:
A Statistical Study Of Crude Oil Prices And It's Effects On Indian Economy

Abstract:

Macro-economic performance of the country are closely related with oil price shocks. The requirement of crude oil increased at rapid pace. Therefore India is one of the country that highly dependent on crude oil imports. Crude is a price determinant among various other commodities. Since rise or fall in price will directly have an impact on price of various commodities and society as whole. Usually the price of crude oil is invariably much lesser than the import duties; it is the import duties which makes it costlier for common man.

The study undertaken in an exchange rate, inflation, whole sale price index (WPI) and Gross Domestic Product(GDP). Study relation between exchange rate and GDP of the country. Also try to develop statistical model for forecasting the crude oil prices. Study the factors that affects on Indian economy. Study the importance of reducing cost of crude oil imports in order to improve the living standards of the common man.

1. Introduction:

Crude oil price fluctuations have become an emerging topic for the entire world. Crude oil can be considered as one of the most influential natural resources in the world economy. Crude oil import dependency is one of the major economic issues for most of the countries. However, the oil exporting countries take this opportunity to perpetuate their economic power. Thus, the crude oil price fluctuation influences not only the oil importing and exporting countries but also the entire world economy in a significant way [10].

Since the beginning of the year 2020, crude oil prices have slumped dramatically. Consumer demand declined of the following fears of a continued spread of the corona virus pandemic and its impact on the economy, which in turn led to a disagreement between two of the largest oil producers, Russia and Saudi Arabia in early March, 2020 [1].

Bilateral talks between global oil producers ended in agreement on 13 April 2020, with promises to cut petroleum output hoping that these might help to stabilize the oil prices in the upcoming weeks [1].

The deal took place when Brent crude, the global benchmark, plunged to its lowest in nearly two decades, falling toward $20 a barrel. Earlier this year, it traded above $70 a barrel. However, with storage facilities and oil tankers quickly filling up, fears grew particularly in the United States over what to do with excess oil, leading to the WTI benchmark falling into negative price at -37.63US Dollars per barrel for the first time in history on 20 April 2020 [9]. This swing into the negative price was an unprecedented event as well as a one-time event.

Negative prices means oil producers are paying buyers to take the commodity off their hands over fears that storage capacity could run out in May [2].This slump in demand has roiled energy markets. Oil prices have slumped, with Brent crude trading near a 21-year low, and US oil futures pushed into negative territory - a historic feat. The resultant glut in oil has overwhelmed the world's limited storage facilities, with ships laden with surplus oil production idling at high seas.

Brent Crude Price is the international benchmark price used by Organization of Petroleum Exporting Countries (OPEC), Since India Imports primarily from OPEC countries, Brent is the benchmark for India. Most of the oil produced in Europe, Africa and the Middle-East is priced according to the cost of Brent crude[11].

The corona virus pandemic has shocked the oil industry, flooding companies with more supply than the world can burn and bankrupting small players. As the corona virus pandemic has kept people at home and ground factories to a halt, demand for oil dropped drastically. At the same time, Russia broke off negotiations to stem drilling with Saudi Arabia and its OPEC+ partners. Instead, the two countries, some of the world's biggest oil exporters, launched a price war by ramping up production and cutting prices in hopes of grabbing more market share[3].

The Indian Basket of Crude Oil :

Crude oil price fluctuations are a frequent market phenomenon that depends on several factors including demand and supply, geo-political situation and policies of crude oil producing countries. International Crude Oil Price of Indian Basket is considered as an indicator of India's crude oil import price. The sharp rise and volatility of prices of oil and petroleum products in the international markets since 2004 became a matter of global concern. The Indian Basket of crude oil, which averaged about $23 per barrel (bbl) at the time of dismantling of APM in March, 2002 and $36/bbl in May, 2004 went up to an average of $111.89/bbl. during 2011-12, $107.97/bbl during 2012-13 and $105.52/bbl during 2013-14. The prices of crude oil, after continuously being at the level of more than $100/bbl for over three years, started falling sharply during the second half of 2014. As a result, the average price of Indian crude oil basket during 2014- 15 to 2019-20 was recorded at $84.16/ bbl, $47.56/bbl, $56.43/bbl, $69.88/bbl and $60.47/bbl[5][6].

According to the Petroleum Planning and Analysis Cell (PPAC), the Indian basket of crude oil represents a derived basket comprising sour grade (Oman and Dubai average) and sweet grade (Brent) of crude oil processed in Indian refineries, in the ratio of 75.50 to 24.50 during 2018-19.

The price of Indian crude basket fell below $20 a barrel during April 2020 as the lockdown resulted in historic dip in transportation fuel demand in the country. The low price of crude oil at international level is a respite for the government as the economy restarts after five weeks of shutdown. The average price of Indian basket was $33.36 a barrel in March 2020 compared to $71 in April 2019 -- the first month of last financial year[4].

Petrol and Diesel rates in India are revised on a daily basis at 06:00 a.m. every day. This makes sure that even a minute's variation in global oil prices can be transmitted to fuel users and dealers. Price of fuel includes excise duty, value added tax (VAT), and dealer commission. VAT varies from state to state. After adding excise duty, dealer commission and VAT, the retail selling price of petrol gets nearly doubled[9]. Various factors impact the price of fuel like rupee to US

dollar exchange rate, cost of crude oil, global cues, demand for fuel, and so on. When international crude oil prices gain, prices in India move higher.

The government on 14 March 2020 hiked excise duty on petrol and diesel by Rs 3 per liter each and then again on 5 May 2020 by a record Rs 10 per liter in case of petrol and Rs 13 on diesel. The two hikes gave the government Rs 2 lakh crore in additional tax revenues. The Oil Marketing Companies (OMCs) had not changed the base prices of petrol and diesel since the mid of March and they also didn't pass the burden of the steep hike in excise duty to the consumer as they adjusted it with the decline in the global oil prices which fell to a two-decade low. However, a rise in value-added tax (VAT) by some state governments and union territories during the past months had led to a rise in the retail prices of the key automobile fuels in some states[7].

At this point, the Centre needs all the revenues it can get. The pandemic has dented all its revenue streams, while adding new expenditure and future liabilities. About 20% of the Centre's tax revenues come from various taxes on fuel, with the big one being excise[8].

2. Review of literature and development in subject:

Oil prices matter to the health of an economy, despite a consistent fall in global oil intensity; crude oil remains an important commodity and events in the oil market and continues to play a significant role in shaping global and political development. Crude oil is the world economy's most important source of energy and is therefore, critical to economic growth. The price of crude in global market is essentially driven by supply and demand. The performance of world economy in general and the world's largest economies such as US, Japan and recently China have a significant impact on the demand for crude oil and vice versa. The various method developed by International Monetary Fund (IMF), World Bank(WB) and Organization for Economic Co-operation and Development(OECD) have estimated that 10 dollar increase in crude oil prices would lead to a decline of world production of goods and services by 0.5%. The world economic growth and world oil demand are moving in tandem and there is high correlation between world economic growth and demand for oil. It is essentially the supply that drives the prices of crude oil. Many researchers agree in opinion that no other economic event in post-World War II era generated as

much attention as the series of oil price shocks, mainly produced by OPEC countries. This issue was new and researchers posed such a question as the numerical impact of oil shocks and their correlation with the policy conducted by government in order to predict the best instrument to cope with the negative impacts caused by oil price increases. Since then a large number of studies have reported a correlation between increases in oil prices followed by economic downturns.

Hamilton [16][17] reported clear evidence of nonlinearity-oil price increases is much more important than oil price decreases. An alternative interpretation was proposed based on the estimation of a linear functional form using exogenous disruptions in petroleum supplies as an instrument. His study shows that oil shocks play a crucial role in determining macroeconomic behavior because they disrupt spending by consumers and firms. Hamilton extended his research work and has presented empirical evidence suggesting that oil price shocks have been one of the main causes of recessions in the United States. Others, including Barsky and Kilian [21] argue that the effect is small and that oil shocks alone cannot explain the U.S. stagflation of the 1970s. Taking a more intermediate position, Bernanke et al. [23] argue that an important part of the effect of oil price shocks on the U.S. economy results not from the change in oil prices per se, but from the resulting tightening of monetary policy. In the same line of research, Blanchard and Gali[22] present evidence showing that the dynamic effect of oil shocks has decreased considerably over time, owing to a combination of improvements in monetary policy, more flexible labor markets, and a smaller share of oil in production. Their results indicate that a 10 percent increase in the price of oil would, prior to 1984, have reduced U.S. GDP by about 0.7 percent over a 2–3 year period, while after 1984 the loss would be only about 0.25 percent. In contrast to the extensive literature on the impact of oil prices on the U.S. economy, there has Outside the U.S., studies of the relationship between oil prices and the macro-economy have almost exclusively been confined to other OECD members, with results suggesting that they tend to be affected in broadly the same way as the U.S. but less strongly.

Tuhran et al.[20] examined the dynamic relationship between oil prices and exchange rate of selected growing economies. It stated three points, first

contrary to the general use of developed country, the researcher taken emerging markets to study the relationship between oil prices and exchange rates. The monetary models to explore the exchange rates , oil is in use as alternative advantage class and use daily oil price data to investigate the dynamics of exchange rate of an emerging market economies. The paper shows how this relation has changed by comparing the relationship before and after the financial crisis.

Hidhayathulla et al.[14] examined the effects of oil price on exchange rate of Indian rupee against US dollar using time series data from 1972-73 to 2012-13. Multiple linear regression models are used to analyze the data. The model result suggests that the import of crude oil continues to rise up when the crude oil future price increases. The oil imports thus became a extensive source of demand for dollar in India's foreign exchange market. This strong demand contributes to strengthen the price of dollar against Indian rupee, among the other factors. This finding will contribute to Indian government in making policy to control the petrol price to avoid rupee depreciation against US dollar.

Sharma et al.[12] Analyzed the effects of crude oil price on Indian economy because India's imports of oil are growing. Our import dependence has reached 80 per cent and is likely to keep mounting. At the same time 2008 saw an extraordinary rise in oil price on the world market. Oil price instability has also amplified. Though future oil prices are difficult to envisage, they are generally probable to rise. The oil prices have started rising significantly since the initiation of the twenty first century. Theoretically, one can judge the impact of an oil price shock. The instantaneous outcome of the oil price shock is the augmented Cost of production due to improved fuel cost. Whenever there is an overall inflation in the economy, the cost of construction would also rise causing a decrease in supply. On the other hand, inflation implies a fall in the purchasing power of people. In short, oil price oscillation has adverse possessions on the economy.

3. Objectives of the research:

At the time of actual research work, new dimensions related to the study will be taken care of. Some of the measure objectives are given below.

- To study and formulate the impact of crude oil prices on the whole sale price index of Indian economy.
- To analyze the relationship between stock market and crude oil prices.
- To formulate and study the change in crude oil prices with the growing inflation.
- To study impact of declining crude oil prices on exchange rate.
- To study how change in crude oil is impacting on GDP at market price.
- To analyze factors that affects on crude oil prices.
- Estimate the crude oil prices.
- To access impact of oil prices on the balance of payment situation of India.
- Try to develop statistical model for forecasting crude oil prices.

4. Methodology

Secondary research is a research which is already been compiled, gathered, organized and published by others. Such data can be obtained faster and are more affordable. Secondary data is available by webs, reading articles, magazines, trade journals etc. The fundamental purpose of study is to check the extent of impact on Indian economy with respect to the parameters in the study. Data collected from 2010-11 to 2020-21.

The source of the data has been taken from primary reports and publications of varies bodies of the Ministry of Petroleum and Natural Gas and Government of India; public sector undertaking annual reports. Economic Data has been collected from the economic survey; Reserve Bank of India data and CSO data. The data of inflation rate (consumer price index) is collected from the trading economics data and the Indian basket Price of Crude oil data has been collected from Petroleum Planning and Analysis Cell (PPAC). Data of world oil has been taken from British Petroleum (BP) statistics in addition to Journals and periodicals reliable constitutional and company publications. Historical perspective of Indian petroleum industry from 1857 has been chronologically brought out to follow the growth and development of the oil industry especially after 1956 under the public sector in various phases both in exploration & production and refining by the Government of India both pre and post

liberalization period, also after the abolition of administered price control mechanism and the resultant data emanating from the evolution has been considered as a source of this research.

The statistical tools such as Regression, Colinearity and inter correlation were used to infer the data. Also multivariate regression analysis, some test can be used by statistical tools.

5. Importance of the study/Society application :

The existing scenario of oil consumption and production of world indicates that there is more demand for than supply of crude oil in general, except a few developed economy, for the developing country like India in particular reveals that the country is able to meet 24% of crude oil requirement and the rests 76% are to be meet through import. Therefore, there are sometimes demand driven price rise otherwise price rise due to supply disruption. Under such circumstances it is very much essential to study the impact of crude oil price on the inflation and economic growth of our country.

International status:

BAIC (The business and industry advisory committee to the OECD), it has shown that the world economy slows down based on the BAIC Member Survey and at that time it was anticipated that the OECD –wide real GDP growth to drop from 3.1 % to 2.6% in 2007 and risk for growth was associated to oil price[24]. Hyun Joon Chang of Korea Energy Economics Institute in his paper "The Impact of Oil Price Increase on the Global Economy" discussed the impact of an oil price increase of $5 per bbl on global economy [25].

"Analysis of the impact of high oil prices on the global economy" by Economic Analysis Division, International Energy Agency reports in "Energy Prices and Taxes", 2nd Quarter 2004, wherein it has shown that the vulnerability of oil importing countries to higher oil prices varies markedly depending on the degree to which they are net importers and oil intensity of their economies[26].

Osama Badr et al.[19]also tried to understand what are the factors that would determine crude oil price fluctuations. They used the quarterly data from 2008Q1 to 2015Q4 for their analysis. They used the Engel and granger

econometric techniques to see the long run effects of supply, demand and factors associated with the behavior of financial market shareholders on the crude oil prices. The results of their model shows that robust effects of GDP growth for both china, an OECD country to the crude oil fluctuations.

National status:

Bhattacharya et al.[15] analyzed the impact of increase in oil price on inflation. They studied the mechanism of increase in the prices of petroleum products on the prices of other commodities and the output in India. In February 1999, from an all time low of 11 U.S Dollars per barrel, it increased to a peak of 35 dollars in the first week of September 2000. Due to this, all oil importing countries faced the threat of oil shock; India, being a major oil importer, was particularly affected. Historically, there have been four oil shocks in the past thirty years. In spite of this, low inflationary pressure has been assisting the developed countries in mitigating the risk associated with oil shocks. Contrary to this, developing countries are affected more because of the absence of advanced technology to conserve oil. Literature reveals that most researchers agree with the fact that inflation has a recessionary effect on oil prices.

Aparna [13] Discussed that positive change in the crude oil price has an immediate negative impact on the increment in the GDP and IIP whereas it affects the WPI positively . While GDP and IIP show signs of oscillating decay over a period of time, WPI, after a positive increment, returns to its original value within four months. A shock or impulse when given to WPI affects GDP in the same fashion considering the fact that WPI also includes other terms apart from fuel which constitute nearly 14.23% weight directly but also indirectly influences other commodity baskets. It also affects the IIP negatively and the effects last for a considerable period of time showing signs of oscillating decay.

Significance of the study:

It is essential the use statistical advanced techniques to solve real life problems and analyze,check the significance,efficiency of the result by different software SPSS, R Progamming, PYTHON etc to optimize it.

6. Proposed work plan/ Formulation and structure of study:

Year wise plan of work and targets to be achieved.

First Year

1. Collect the information and study the structure of Indian economy.
2. Study the applications of statistical techniques.
3. Study of different software packages.

Second Year:

1. Collect secondary data from different websites of Government of India and international data.
2. Summarize and analyze the data.
3. Try to develop statistical model.
4. Apply statistical tools or software to get the result**.**
5. Comparative study of crude oil prices and GDP at market prices.

Third year:

1. 1. The publication of the findings of the research.
2. Publication of papers in various national and International journals and conferences.
3. Thesis writing

7. References

1. The Economic Times dated 13.04.2020

https://energy.economictimes.indiatimes.com/news/oil-and-gas/oil-price-war-ends-with-historic- opec-deal-to-cut-production/75114561

2. BBC News dated 21.04.2020

https://www.bbc.com/news/business-52350082

3. Time.com dated April 20 2020

https://time.com/5824263/coronavirus-negative-oil-prices-consolidation/

4. Business today dated 17.04.2020

https://www.businesstoday.in/current/corporate/lockdown-impact-indian-crude-basket-trips-below-20-per-barrel-import-bill-to-go-to-record-low/story/401336.html

5. Ministry of Petroleum and Natural Gas, Annual Report 2018-19, p.112

http://petroleum.nic.in/sites/default/files/AR_2018-19.pdf

6. Indian Petroleum &Natural Gas Statistics 2018-19

http://petroleum.nic.in/sites/default/files/arep2020.pdf

7. The Indian Express dated. 09.07.2020

https://indianexpress.com/article/business/commodities/petrol-and-diesel-rates-what-is-causing-a-rise-in-fuel-prices-6470644/

8. https://www.livemint.com/news/india/how-the-centre-is-using-oil-price-decline-to-reset-expectations-and-boost-revenues-11592301490668.html

9. The Economic Times dated 15.07.2020

https://economictimes.indiatimes.com/wealth/fuel-price/petrol?from=mdr

10. http://www.informaticsjournals.com/index.php/sdmimd/article/view/21683

11. Money Control dated 21.04.2020

https://www.moneycontrol.com/news/world/what-is-the-difference-between-brent-and-wti-crude-oil-5170021.html

12. Anshul Sharma, G. S. (2012). Impact Of Crude Oil Price On Indian Economy . *International Journal Of Social Sciences & Interdisciplinary Research Vol.1 No. 4, April 2012, ISSN 2277 3630*, 95- 44

13.A. Aparna (2014), Impact of oil Prices on Indian economy, *NMIMS Management Review*, 23: 141-147*Int. J. Modern Mgmt. Sci.* **2015**, 4(1): 11-26

14. M. Rafee, Dr. A. Hidhayatuallah (2015), Relationship between International Crude oil price and Inflation rate in India from 2011 to 2014, *International Journal of Advanced Research*, 3(5): 242-250

15. Bhattacharya, Kaushik and Bhattacharya , Indranil (2001) 'Impact of Increase in Oil Prices on Inflation and Output in India', Economic and Political Weekly, Vol.36, No.51, pp 4735-4741.

16. Hamilton, J. D. (2003). What is an oil shock?. Journal of econometrics, 113(2), 363-398.

17. Hamilton, J. D., & Kim, D. H. (2000). A re-examination of the predictability of economic activity using the yield spread (No. w7954). National Bureau of Economic Research.

18. IMF Research Department (2000); "The Impact of Higher Oil Prices on the Global Economy;" Washington: International Monetary Fund, December.

19. Osoma M Badr, &. A.-K. (N.D.). Determinants Of Crude Oil prices.

20. Ibrahim Tuhran and et.al (2012) "oil prices and emerging market exchange rates", Central Bank of republic of Turkey, Middle East Technical University-MPRA Paper No: 36477, Feb 2012.

21. Barsky, R. B., & Kilian, L. (2004). Oil and the Macroeconomy since the 1970s. The Journal of Economic Perspectives, 18(4), 115-134.

22. Blanchard, O. J., & Gali, J. (2007). The Macroeconomic Effects of Oil Shocks: Why are the 2000s so different from the 1970s? (No. w13368). National Bureau of Economic Research.

23. Bernanke, B. S., & Mishkin, F. S. (1997). Inflation targeting: a new framework for monetary policy? (No. w5893). National bureau of economic research.

24. BAIC Economic Review (2006) "The Voice of OECD Business", (The business and industry advisory committee to the OECD), Autumn 2006, pp-3-8.

25. Hyun Joon Chang, (2005) The Impact of Oil Price Increase on the Global Economy, Korea Energy Economics Institute

26. IEA (2004) "Analysis of the Impact of High Oil Prices on Global Economy", Economic Analysis Division, Energy Prices and Taxes, 2nd Quarter 2004, pp. 11-19.

Signature	**Signature**
Research Scholar	**Research Guide**
Mrs. Shital Vijay Baisane	**Dr. Vinayakrao A. Jadhav**